

# SBIR Contract DTRT57-08-C-10046

## Driver Fatigue, Distraction, and Alerting Technology

### Technical Brief

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**Introduction**

Driver fatigue and distraction remain a significant safety issue for commercial fleets and their drivers. The National Highway Transportation Safety Administration has estimated that over 100,000 crashes caused by drowsy drivers each year resulting in more than 1500 fatalities and 71,000 injuries. This relates to about 1.6% of all crashes and 3.6% of all fatal crashes for all vehicle and driver types combined. In addition, drowsy driving is likely underestimated due to unreported off-road crashes, the authorities inability to verify drowsiness as a contributing factor, and erroneous driver reporting. In a recently released report to congress on the causation of large truck crashes, fatigue was cited as an associated factor in 13% of all large truck crashes. In a recent survey, over 25% of truckers indicated they had fallen asleep at the wheel in the previous month and at trucking summit meetings, drowsy driving is consistently identified as the most important safety concern among commercial drivers

**Background**

Despite substantial developments in in-vehicle drowsy driver detection, a robust and affordable commercial product has yet to achieve sufficient market penetration to impact the driver drowsiness problem. We believe existing systems suffer from one or more of the following problems; high cost, obtrusiveness, operational limitations, robustness in the trucking domain, and a lack of general effectiveness or driver acceptance. It is not likely that any single, real time measure of driver drowsiness will be obtainable 100% of the time from 100% of the driver population. Therefore, a multi-measure algorithm based on variables that are likely to be available and can be obtained in real time will be required to create a robust system. In particular, such an algorithm must be able to handle missing or imperfect data sources without significantly compromising overall accuracy. Such a system will likely make use of driver, vehicle, and environmental factors.

**Summary of Work to be Accomplished**

The work tasks to be accomplished during Phase I include the following:

- 1) Develop a database of drowsy driving events from existing naturalistic driving data sets. The events will be used generate and validate candidate multi-measure algorithms.
- 2) Discriminate analysis and classification techniques will be used to identify predictive measures, generate candidate multi-measure algorithms and test the algorithms for accuracy.
- 3) A video-based eye and head tracking system will be enhanced and improved to optimize the ability to accurately measure PERCLOSE and other drowsiness-related behaviors
- 4) The optimal algorithm will be implemented into an in-vehicle processing system making use of eye tracking, lane tracking and other driver, vehicle, and environmental measures.
- 5) An on-road demonstration of the system will be created to measure the functional potential of the multi-measure algorithm.